$$=\frac{4a^2b^4c^4}{(bc+ab-ac)(bc-ab+ac)(ab+ac+bc)(ab+ac-bc)}$$

$=\dfrac{4a^2b^4c^4}{\triangle}$, where $\triangle$ is the denominator of the above fraction.

$$y^2+s^2=\frac{4a^4b^2c^4}{\triangle}, \text{ and } z^2+s^2=\frac{4a^4b^4c^2}{\triangle}.$$

$$\therefore x=\pm\left(\frac{4a^4b^2c^4-s^2\triangle}{\triangle}\right)^{\frac{1}{2}}, \; y=\pm\left(\frac{4a^4b^2c^4-s^2\triangle}{\triangle}\right)^{\frac{1}{2}}, \text{ and}$$

$$z=\pm\left(\frac{4a^4b^4c^2-s^2\triangle}{\triangle}\right)^{\frac{1}{2}}.$$

$x^2+s^2=0$ is not admissible.

PROBLEMS FOR SOLUTION.

ALGEBRA.

363. Proposed by E. B. ESCOTT, Ann Arbor, Mich.

(a) If a and n be positive integers, the integral part of $[a+\sqrt{(a^2-1)}]^n$ is odd.

(b) If a and n be positive integers, the integral part of $[\sqrt{(a^2+1)}+a]^n$ is odd when n is even and even when n is odd. [From Todhunter's *Algebra*, p. 353].

364. Proposed by J. SCHEFFER, A. M., Hagerstown, Md.

The English physicist, Hooke, published the discovery contained in the Latin sentence, "Ut tensio sic vis" by the cypher *cciiinosssttuv*. Preserving the lexicographical order, find which permutation, taking all letters, the Latin sentence is from the cypher.

365. Proposed by C. N. SCHMALL, New York City.

In still water, a steam tug goes 6 miles an hour less when towing a barge than when alone. Having drawn the barge 30 miles up a stream, whose current runs 1 mile an hour, it returns alone and completes the journey in 12 8/11 hours. Find the rate of the tug in still water.

GEOMETRY.

396. Proposed by DANIEL KRETH, Oxford, Iowa.

In the triangle ABC, $AB=214$, $BC=263$, and $AC=405$. A point P is situated in the same horizontal plane; angle $BPA=13°\ 30'$ and angle $BPC=29°\ 50'$. Find the distances, AP, BP, and CP.

397. Proposed by DAVID F. KELLEY, New York City.

If ABC be a semicircle and CD a perpendicular from C on the diameter AB, prove that the radius of the circle inscribed in the triangle ABC equals half the sum of the radius of the circle touching arc AC and the sides AD and DC of the triangle ADC, and the radius of the circle touching arc CB and sides DB and DC of triangle CDB, and that the centers of the three circles are collinear.

398. Proposed by C. N. SCHMALL, New York City.

In a square $ABCD$ draw the diagonal AC. Now bisect AD in G and draw GB cutting AC in H. Prove that $\triangle AGH=\frac{1}{2}\triangle CGH=\frac{1}{3}\triangle ABG=\frac{1}{4}\triangle BCH$.

CALCULUS.

318. Proposed by JOHN C. GREGG, Greencastle, Ind.

A thread is wound spirally n times around a cone, the radius of whose base is r, and slant height h, the turns being at uniform distance apart. If the thread is kept taut, what will be the length of the trace of its end on a horizontal plane?

319. Proposed by C. N. SCHMALL, New York City.

Given $u=\frac{yz}{x}$, $v=\frac{zx}{y}$, $w=\frac{xy}{z}$, prove

$$\begin{vmatrix} \frac{\partial u}{\partial x}, & \frac{\partial u}{\partial y}, & \frac{\partial u}{\partial z} \\ \frac{\partial v}{\partial x}, & \frac{\partial v}{\partial y}, & \frac{\partial v}{\partial z} \\ \frac{\partial w}{\partial x}, & \frac{\partial w}{\partial y}, & \frac{\partial w}{\partial z} \end{vmatrix}=4xyz.$$

MECHANICS.

265. Proposed by A. H. HOLMES, Brunswick, Maine.

A gun is mounted in a fort at height h above the sea, and a similar gun is mounted on a ship. Show that there is a region of area $4\pi rh$ within which the ship is within range of the fort while the fort is out of range of the ship, r being the maximum range of either gun on a horizontal plane through it.

266. Proposed by A. M. HARDING, Assistant Professor of Mathematics, University of Arkansas.

A, B, C are three equidistant smooth pegs in the same horizontal line, and a heavy uniform string has its ends tied to A, C, and is looped over B. Show that there may or may not be a position of equilibrium in which the two catenaries, AB, BC, are unequal, and if there is such a position it will be stable. Show that the position of equilibrium in which the middle point of the string is at B is unstable or stable according as an unsymmetrical position of equilibrium does or does not exist. [Jeans' *Mechanics*, page 187].

AVERAGE AND PROBABILITY.

208. Proposed by A. M. HARDING, Assistant Professor of Mathematics, University of Arkansas.

Find the chance that the distance of two points within a square shall not exceed a side of the square.